

Lower Permian Fauna from Manning Facies Rocks along the Peel-Manning Fault System, Glenrock Station, Southern New England Orogen

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A fragmentary macrofossil assemblage consisting of *Eurydesma*, *Keenia* and *Peruvipsira* was collected from Manning facies sediments in the Peel-Manning Fault System at Glenrock Station. The sedimentary succession containing the faunal assemblage has been variably tectonised, but indicate Lower Permian, Fauna II affinities. Volcaniclastic sediments in which the fossils are found are similar to the adjacent rocks of the Devonian Gamilaroi terrane and the presence of the Lower Permian sediments has revised previous mapping of the area, extending the width of Peel-Manning Fault System in this area.

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INTRODUCTION

The New England orogen in northeastern New South Wales is an amalgum of mid to late Paleozoic terranes. Paleontological evidence provides age constraints vital to understanding the sequential development and relative depositional settings of different rock units which have later been juxtaposed along faults within tectonically complex areas. Furthermore this evidence provides constraints which enable definition of the timing of relationships between adjacent terranes in orogenic collages (Coney *et al.*, 1980).

Strata within sedimentary basins which developed in response to transtension and transpression during a period of highly oblique plate convergence in the Early Permian record a history of terrane displacement along strike-slip faults within the New England orogen (Aitchison and Flood, 1992). These sediments are typically assigned to the Manning Group (Mayer, 1972). Numerous discrete sedimentary basins, each with a similar sedimentary facies, appear to have developed along major strike-slip faults in New England during the Early Permian. Sediments in many of these basins were never contiguous with similar facies in adjacent basins, thus in a pure lithostratigraphic sense it is inappropriate to refer to these rocks as a single orogen-wide 'Manning Group'. The term 'Manning facies' is more appropriate. Diamictites deposited out of high-density mass flows are the characteristic unit of the Manning facies sedimentary rocks, these vary from basin to basin, both in terms of up-section trends in clast composition and the clast-matrix relationships (Aitchison and Landis, manuscript in preparation).

Glenrock Station is located 90 km north of Scone on the Ellerston-Barry Road in the New England region of northeastern NSW. Three distinctly different tectonostratigraphic terranes, the Weraerai, Gamilaroi and Djungati terranes (Flood and Aitchison, 1992), and a younger sedimentary assemblage derived from these terranes are present in

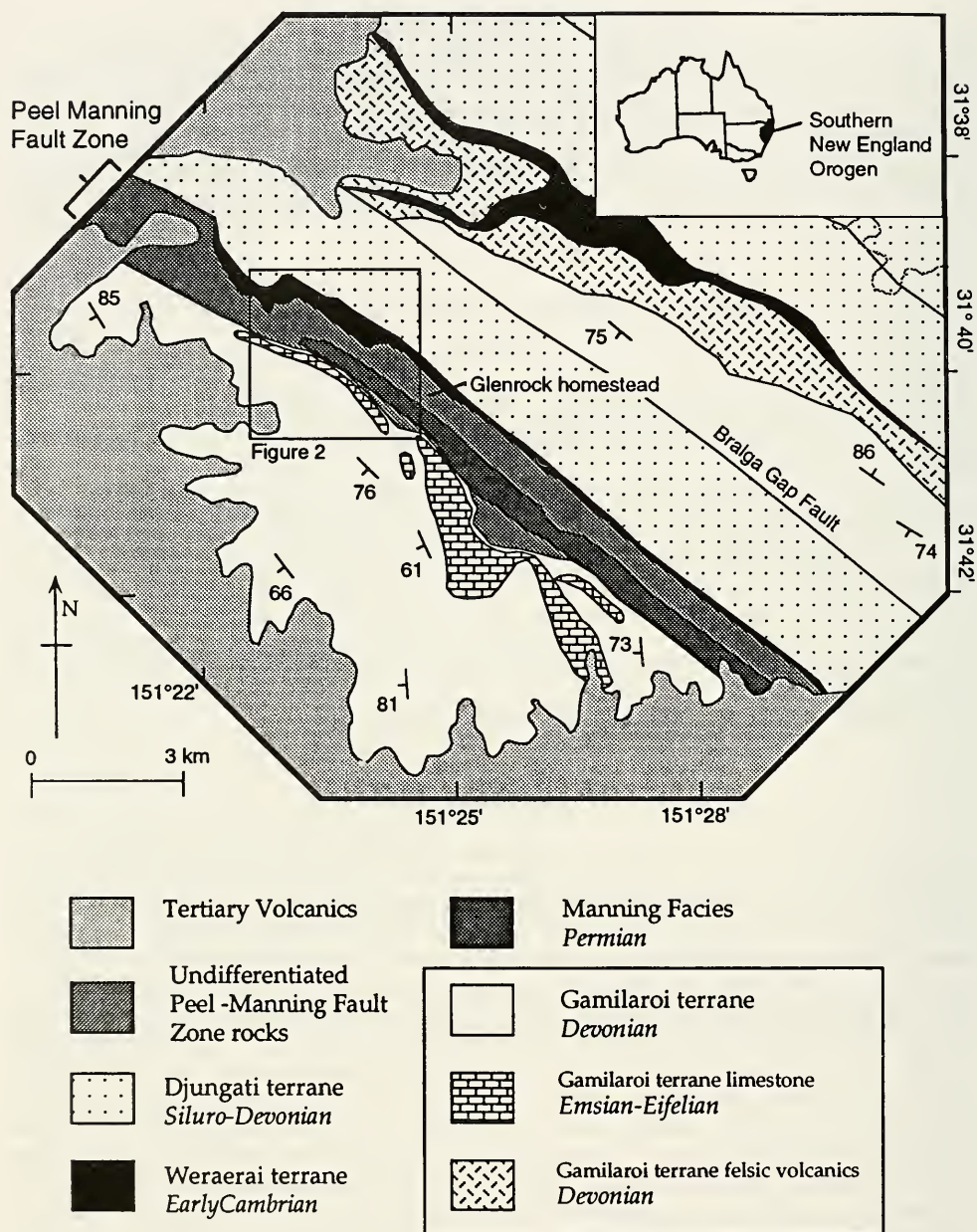


Fig. 1. Simplified geological map of Glenrock Station showing the distribution of the different rock units and the position of the fossil locality map Fig. 2.

the Glenrock district (Fig. 1). The Gamilaroi terrane is a Devonian intra-oceanic island arc assemblage of volcanoclastic sediments, tuffaceous mudstones intercalated with dolerite and gabbro sills, pillow basalts and felsic tuffs (Aitchison and Flood, 1994). Distinctive red cherts of Silurian to Upper Devonian age, minor basalts and volcanoclastic sediments repeated by imbricate thrust faults reminiscent of an subduction complex form the Djungati terrane (Aitchison *et al.*, 1992a). The Djungati terrane is separated from the Gamilaroi terrane in the southwest by strands of the Peel-Manning Fault System (PMFS). The PMFS is a fundamental structural discontinuity within the southern New England orogen. Rocks associated with the Weraeraí terrane, a dismembered Early Cambrian ophiolite (Aitchison *et al.*, 1992b; Aitchison *et al.*, 1994; Aitchison and Ireland, 1994) are commonly associated with the PMFS; these have undergone widespread serpentinisation and structural dismemberment during its emplacement at high structural levels.

The PMFS is imbricate at Glenrock station. The main trace of the fault at Glenrock is marked by a km-wide zone of tectonic melange with various blocks, some of mappable size, enveloped in serpentinite and mudstone matrix. Rapidly-deposited Lower Permian marine sedimentary rocks of the Manning facies are common along the PMFS and it is from a zone of these rocks that we report a new discovery of fossils.

The fossils occur in poorly-sorted volcanoclastic conglomeratic sandstones. The main component of these sandstones are clasts of dolerite up to 12 mm long which are set in a framework of medium sand-sized plagioclase and pyroxene grains derived from the same doleritic source as the clasts. The dolerites are most probably sourced from the adjacent Gamilaroi terrane. Similar volcanoclastic sandstones also occur within the Gamilaroi terrane sediments indicating that Devonian sedimentation was partially autocannibalistic and making discrimination between unfossiliferous Gamilaroi terrane and Manning facies rocks difficult. Elsewhere (in the Barry and Pigna Barney districts adjacent to Glenrock) altered serpentinite clasts in the sediments are found within coarse grained Manning facies rocks, indicating that some detritus in these sediments originated from the Weraeraí terrane. Red chert is a common clast lithology within Manning facies sedimentary rocks (Aitchison and Flood, 1992) elsewhere in the New England orogen, including Glenrock, though it is absent from sedimentary rocks near the fossil site. This suggests that the Djungati terrane was not a significant source in this section of the basin at the time the fossiliferous sediments were deposited.

Due to their appreciable volcanic component, these coarse volcanoclastic sandstones were originally mapped as part of the Gamilaroi terrane. Identification of the Permian fauna has extended the previously mapped distribution of the Manning facies at Glenrock, increasing the recognised width of the PMFS and demonstrating the importance of fossil age control when mapping highly dismembered fault zones.

PALEONTOLOGY

Material was collected from one site (GR 471950 on the Glenrock 9134-I-S, 1:25 000 topo sheet; Fig. 2). The fossils occur as casts in extremely hard blue-grey conglomeratic sandstone. Shell material is usually incomplete and has largely been removed by weathering, though occasionally the spiral internal moulds of the gastropods remain (Fig. 3G). The sediment which infills some of the gastropods differs from the surrounding matrix (Fig. 3H) indicating that some of this material is redeposited. This interpretation might also explain the predominance of single *Eurydesma* valves which were disarticulated at the time of deposition.

The remaining shell material was dissolved in dilute HCl before latex casts of the fossils were made. Most specimens have been tectonically altered to some degree and are often quite distorted. Tectonic distortion of the fossils means that considerable care had to be taken with identifications, which were only possible to genus levels.

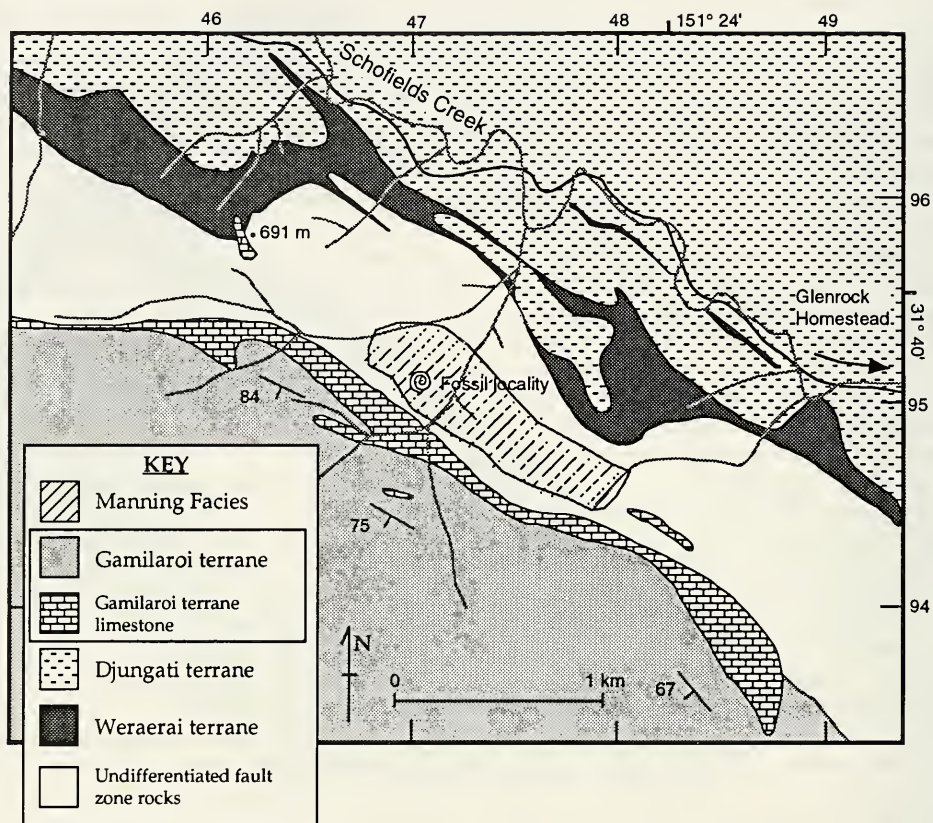


Fig. 2. Geological map indicating the position of the Permian fossil locality within the Peel-Manning Fault System.

All specimens are catalogued with the Australian Museum (AMF).

Class PELECYPODA

Family EURYDESMIDAE Reed, 1932

Eurydesma sp. indet. (Fig 3 A-C)

Type species. *Eurydesma cordata* Morris, 1845

Diagnosis. see Runnegar (1970a)

Discussion

The material is fragmentary. Shells are equivalved, sub-circular to slightly elongate oval in shape. All specimens are relatively small (Table 1), the maximum dimension to close to 45 mm in height. Original calcareous shell material is rare. Shell thickness is 1 and 2 mm, the valves are moderately inflated.

Umbones are low and broad, centred on circular specimens, pointing slightly towards the anterior on more elongate shaped shells. Beaks are inrolled, the left valve apparently more so than right valve. Ligament areas are up to 7 mm in width on posterior

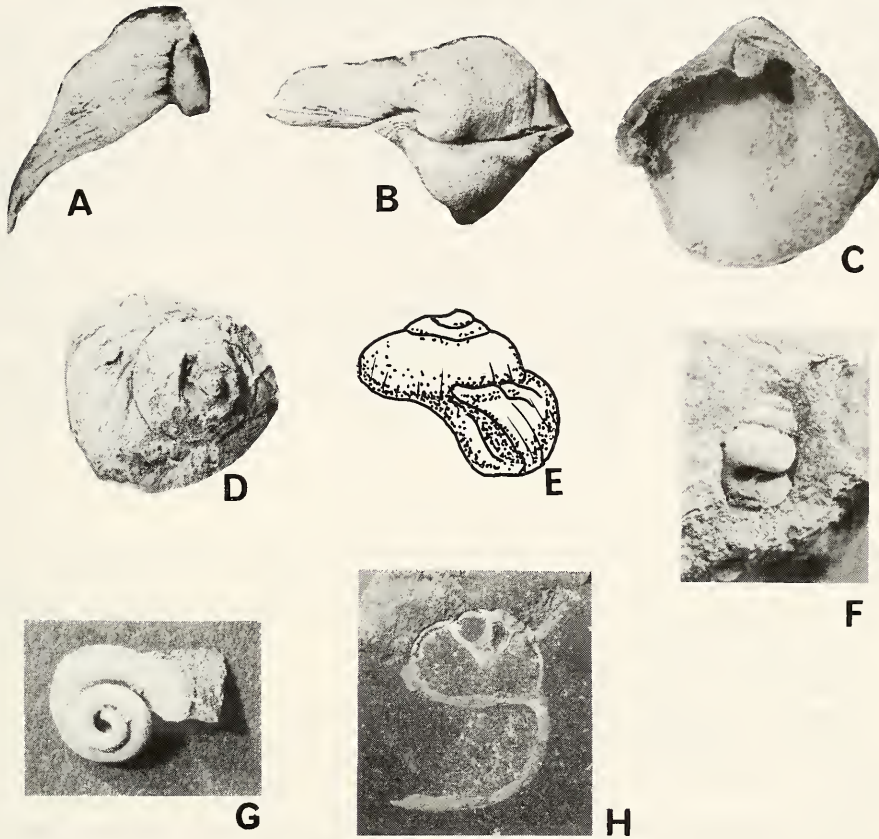


Fig. 3. Fossils from the Lower Permian Manning facies at Glenrock Station. A-C, *Eurydesma* sp. A, Latex cast of byssal notch right valve, AMF 92620, x1.5. B, Latex coast of dorsal view, AMF 92619, x1.3. C, Latex cast of lateral view of left valve, AMF 92617, x2. D, E. *Keenia* sp. D, Latex cast of apical view, AMF 92627, x1.5. E, Latex cast of apertural view, AMF 92621, x1.7. F, *Peruvipsira* sp., AMF 92628, x5. G, Natural internal mould of *Keenia* sp. AMF 92625, x2.8. H, Transverse section through *Keenia* sp. showing different, lighter coloured sediment infilling, AMF 92626, x1.5.

ventral margin. Dental process are well developed with a byssal notch present on right valve. Muscle scars are not observed.

The enlarged dental process present in the right valve, characteristic umbones, ligament area and thick shell are all characteristic of *Eurydesma*. However, the actual species is difficult to determine due to the small size of the specimens. The moderate inflation is most similar to *E. hobartense*, though tectonic compression is the most likely reason for the elongate dimensions of some specimens and it may also be responsible for the apparent lack of inflation. *Eurydesma hobartense* ranges from the Allandale Fauna through to Fauna III (Runnegar, 1970b).

TABLE 1
Measurements for Eurydesma sp. from the Manning facies sedimentary rocks at Glenrock.

<i>Eurydesma</i>	Length (mm)	Height (mm)	Thickness (mm)
AMF 92614	37	36	13
AMF 92615	35	28	10
AMF 92616	31	37	9
AMF 92617	25 min.	24	7
AMF 92618	23	25	5 min.

TABLE 2
Measurements for Keenia sp. from the Manning facies sedimentary rocks at Glenrock.

<i>Keenia</i>	Height (mm)	Width (mm)	Apical angle (°)
AMF 92621	19	21	99
AMF 92622	20	22	127
AMF 92623	9	13	118
AMF 92624	19	15	112

Class GASTROPODA

Family EUPHALIDAE De Koninck

Keenia sp. indet. (Fig. 3D, E)

Type species. Keenia platyschismoides Etheridge Jr., 1902

Diagnosis. see Dickins (1957)

Discussion

Large turbiniform shells with adpressed whorls and a flat spire (Table 2). Whorls are much wider than high and moderately convex on the upper surface, though the basal whorl has increased convexity. The aperture is ovate. Ornament is present only on lower part of the shell and consists of growth lines parallel to the edge of the aperture, becoming very prominent in the last 2 to 5 mm approaching the outer lip.

Comments on the shape and possible affinities of these forms must be tempered with the likelihood of tectonic distortion. The apical angle of these specimens varies from 115-125° which is most similar to *K. canarvonensis* (Dickens, 1957), especially when compared to the lower 95-105° apical angles of *K. platyschismoides* and *K. ocula*, or the higher 130-145° angles of the broader whorl forms such as *K. minor* (Fletcher, 1958).

Family PLEUROTOMARIDAE D'Orbigny

Peruvispira sp. indet. (Fig. 3F)

Type species. peruvispira delicata Chronic, 1949

Diagnosis. see Dickins (1961)

Discussion

Single very small specimen 4 mm in height and 3 mm wide. Tall turbinate spire with tightly coiled whorls and an apical angle approximately 60°. Traces of characteristic selin-zone barely visible on the last whorl.

AGE

Previous estimates for the Manning facies sedimentary rocks at Glenrock from faunal and floral remains indicate Upper Carboniferous to Lower Permian affinities (Offler, 1982). On the basis of the fauna reported herein, these rocks are considered to be Lower Permian, possibly Sakmarian.

Manning facies faunas previously described from the New England region are usually associated with Fauna II (Runnegar, 1969), correlated with Fauna II of the Bowen Basin (Dickins *et al.*, 1964). Locality 37 from north of Attunga (Runnegar, 1970b) is the only published locality of Manning facies rocks in which the faunal elements from Glenrock, *Eurydesma*, *Peruviospira* and *Keenia*, are also reported together. Fauna II suggests Lower Permian affinities for the Glenrock strata, with a range, based on the presence of *Eurydesma* in eastern Australia, from upper Asselian [Allandale Fauna] to upper Artinskian [Ulladulla Fauna] (Runnegar, 1970b).

Manning facies sedimentary rocks from the nearby Pigna Barney region, south of the Glenrock Permian rocks, contain a brachiopod-bryozan dominated fauna of Tastubian (lower-middle Sakmarian) age (Dongal, 1994). Close spatial correlation between these localities supports assignment of the Glenrock assemblage to fauna II (Sakmarian).

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